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# P A P E R S

RELATING TO

**PROPOSALS FOR ESTABLISHING**

## COLLEGES OF ARTS AND MANUFACTURES

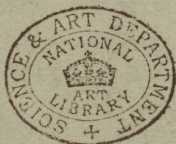
FOR THE

**BETTER INSTRUCTION OF THE INDUSTRIAL CLASSES.**

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MEMBER OF COUNCIL OF THE INSTITUTION OF CIVIL ENGINEERS, ETC.

*FOR PRIVATE CIRCULATION.*



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## INTRODUCTION.

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To place before the Royal Commission, in detail, the views and arguments which an imperative sense of duty has urged me to submit, while suggesting some improvements in the long-neglected education of the middle classes, in science and in art, requires, I hope, no apology. I have endeavoured to show that the present is the most favourable and opportune moment for grafting on the results of the Exhibition a better and more general system of scientific education for the rising generation of manufacturers, than can at present be attained except in very isolated cases.

The collection of the works of human industry, coming from all parts of the world, and now presented to view beneath the roof of the Crystal Palace, was purposely brought there for our improvement and instruction. The lesson has been received thankfully, and has sunk deep into the minds of most men. That improvements and instruction have been already partially effected, the accompanying copies of some of the many memorials forwarded to the Royal Commissioners will amply demonstrate. Men of the highest eminence in science, the arts, and manufactures, have witnessed, faithfully registered in the works of foreign nations, the rapid advances which they are making in almost every branch of art and taste, and they have rightly attributed these advances to the improved system of scientific practical education which is now so easily attainable in many cities and provinces on the Continent.

Devoted as I have been to the applied sciences, and seeking, as I have done, useful knowledge and practical ex-

perience, it has been only at a great sacrifice of time, of money, and of advantages, that I have acquired just so much knowledge to prove to me how much more I have lost, what difficulties have beset my path, and what incalculable and precious advantages I might have obtained, if such an establishment as the College of Arts and Manufactures had been open to me with my limited means in early life.

Under such feelings, and with some experience gained during my travels in other parts of the world, I addressed my first letter in July last to Earl Granville, and with that feeling strengthened by my visit to the Conservatoire des Arts et Métiers, &c., in Paris, I was emboldened again to notice the advantages which our continental neighbours enjoy over us in practical education. I have added a short description of the Conservatoire des Arts et Métiers, and the Central College of Arts and Manufactures at Paris—there are many such institutions besides, not only in the great cities generally of the Continent, but in its provincial towns.

The necessity of some such improvement in scientific practical instruction is forcibly demonstrated in the Exhibition itself.

The memorials from the principal manufacturing districts show how deeply rooted that feeling is, and it only remains to find the best and most practicable means of insuring the improvements we desire, not only for the metropolis and the great manufacturing provinces, but for the whole nation.

At the outset, my first hope was to see a museum of arts and manufactures established from the collections of the Exhibition, to be subservient to, and to illustrate, scientific instruction. If the principle be good, it is quite evident that the surplus of the receipts from the Exhibition would be totally inadequate to carry out any general amelioration of the educational system. In the words of one of our most venerated bishops—"If that principle be true and good, it is not 200,000*l*.



“ that the whole nation would gladly contribute, but two millions, if necessary, to carry out a work which would tend to the benefit of the whole empire, by the elevation of the industrial classes in all their grades, to a higher intellectual standard than has ever before existed amongst them.”

Under such circumstances, the results of the Exhibition would be of permanent value to Great Britain. If the subject of education was taken up by the country, we could well afford to do so, without drawing from the funds of the Royal Commission, which might then be devoted to some object more general than our own exclusive advantage, and rather be destined for the future encouragement of international exhibitions of specialities.

The subject has now expanded so far beyond the grasp of my own arguments, that I hope I shall be excused in recording the opinions of others more deeply experienced than I have been in the wants of the country.

So long back as 1836, a Committee of the House of Commons on Arts and Manufactures, made a Report, from which the following is an extract :—

“ In taking a general view of the subject before them, the Committee advert with regret to the inference they are obliged to draw from the testimony they have received, that from the highest branches of poetical design, down to the lowest connexion between design and manufactures, the arts have received little encouragement in this country. In many despotic countries far more development has been given to genius, and greater encouragement to industry, by a more liberal diffusion of the enlightening influence of the arts. Yet to us, a peculiarly manufacturing nation, the connexion between art and manufactures is most important; and for this merely economical reason (were there no higher motive), it equally imports us to encourage art in its loftier attributes, since it is admitted, that the cultivation of the more exalted branches of design tends to advance the humblest pursuits

“ of industry, while the connexion of art with manufacture has  
 “ often developed the genius of the greatest masters in design.”

In 1846, the Rev. Dr. Booth, chaplain to the Marquis of Lansdowne, and formerly Principal of Bristol College, wrote a pamphlet on education and educational institutions, with reference to the industrial professions, and quoting the opinions of Sir J. Herschel, Dr. Whewell, Professor de Morgan, Dr. Cooke Taylor, and others. The arguments there set forth so perfectly illustrate the necessity of improved education, and so ably support the views I have attempted to define, that I will use some of his reasons for urging the necessity of establishing some such system.

Introducing the subject of industrial education, he says :—

“ To any one who has carefully noted the rapid progress  
 “ of discovery, and watched the ever-varying phases of Euro-  
 “ pean society, it must be apparent, that a greater change has  
 “ taken place during the last thirty years, than in the whole  
 “ period intervening between our revolution and the close of  
 “ the last continental wars. New interests have arisen—new  
 “ channels of commerce have been opened—old sciences revo-  
 “ lutionized, and new ones discovered—their applications to  
 “ the practical affairs of life, the true test of the value of a  
 “ science, in the opinion of Bacon, are numerous beyond any  
 “ former precedent—and the dominion of man over the realms  
 “ of nature is more widely spread and firmly established.

“ Thus, while the whole aspect of society has been changed—  
 “ our political institutions remodelled—our colonies metamor-  
 “ phosed from factories into empires—the rules of international  
 “ law defined—the principles of internal government amelio-  
 “ rated—and those which ruled our intercourse with foreign  
 “ nations abandoned—the circle of the sciences daily en-  
 “ larging—Saxon laws, manners, and religion hourly expanding  
 “ the sphere of their influence from us, as from a centre, till  
 “ it is no longer a matter of faint hope, but of cheering pro-  
 “ bability, that the ‘ whole earth shall be one language, and of



“one speech,’ if not literally at least actually—we find the  
 “education of the poorer classes only just begun, that of the  
 “middle and upper classes stationary or retrograde, little  
 “changed from that of which Milton expressed his con-  
 “demnation.”

Sir John Herschel draws a true picture of the times, in saying:—“Whole branches of continental discovery are un-  
 “studied, and indeed almost unknown even by name. It is  
 “vain to conceal the melancholy truth. We are fast drop-  
 “ping behind. In Mathematics we have long since drawn  
 “the rein, and given over a hopeless race. In Chemistry  
 “the case is not much better.”

Professor De Morgan observes:—The present neglect of  
 “natural philosophy and natural history will furnish a curious  
 “story for after times. It will be on record, that among  
 “the first commercial people in the world, who depended for  
 “their political existence on trade and manufactures, there  
 “was not, generally speaking, in the education of their youth,  
 “one atom of information on the products of the earth, whether  
 “animal, vegetable, or mineral, nor any account of the prin-  
 “ciples, whether of mechanics or of chemistry, which, when  
 “applied to these products, constituted the distinction of  
 “their country. And this, when the studies, so abandoned,  
 “were allowed by all to be worthy of pursuit, simply as an  
 “exercise of the reason, and without any reference to their  
 “application. This story will one day excite some wonder,  
 “which will be removed when it is added, that the tone of  
 “school education was given by certain endowed establish-  
 “ments, which, resting their existence upon the fame acquired  
 “when Latin and Greek were reputed the only useful branches  
 “of instruction, used their influence to exclude all others, long  
 “after the rational part of mankind had pronounced that more  
 “was necessary.”

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\* Education and Educational Institutions considered with reference to the Industrial Professions. London, T. W. Parker. p. 6.

The requirements of a clever youth, coming from a first-rate school of the present day, are generally that he will be found to be tolerably well skilled in the mysteries of longs and shorts, to have acquired a facility of stringing together dog-grel verses, to have construed unconnected scraps from ancient writers, such as are to be found in popular selections of extracts, his attention having never been drawn to any of those models of classic purity so numerous in his own ; familiar with the genealogies and exploits of the heathen divinities ; well versed in the history of the Trojan war and the feuds of the Grecian heroes, and but little in the social convulsions of his native soil, and the political storms which have swept over its face ; slightly acquainted with geography ; initiated into arithmetic, not as a science built upon principles, but as a set of rules, the arbitrary invention (for anything he knows to the contrary) of the bookmaker ; and acquiescing upon trust in a few propositions of Euclid.

Liberated from the irksome and monotonous detail of his taskmasters, he enters gladly on some professional career—he is placed in the office of a man of great eminence, “ who has no leisure to teach his apprentices the principles of those sciences on which his art is founded, and “ their applications to the business in hand ; and even although “ he had, he cannot communicate them clearly, and in logical “ connexion, for although he now knows them, he has not “ been taught them himself, but has picked them up, one “ here, now, another there, again, often through the blunders “ of himself or others ; so that, left to grope his way, it is “ strange indeed if the pupil ever, or at least till late in life, “ acquires a knowledge of his art. The young man then “ starts in life with the disheartening reflection, that his long “ years of laborious drudgery at school have been thrown “ away ; can it be a matter of surprise, that he should look “ upon learning as a humbug,—that he should loathe the “ thoughts of Greek or Latin, having been forced to swallow



“ their bitters and permitted to taste none of their sweets,—  
 “ that, loosed from control and left in comparative freedom, the  
 “ more perilous from recent restraint, without mental resources,  
 “ the gnawing of the passions, ‘ those vultures of the mind,’  
 “ now for the first time felt,—he should waste his leisure hours  
 “ in frivolous and unprofitable amusements.”

I have, in my letter of the 12th of August, endeavoured to show the different feelings that exist in the youth of France when they have the advantage of acquiring, at an early age, high scientific knowledge in combination with interesting practical demonstration. I have witnessed in many others the intellectual pleasure which practical mechanics and applied sciences afforded to them. Study, intense and even laborious, *does* become fascinating, and mathematics and the most abstract sciences are then a charm, as auxiliaries, to pursue the researches and acquire the knowledge which a youth so trained now thirsts for.

With such opinions, I have ventured to address the accompanying papers. It is to such devotion to practical science that we can boast of such men as Wollaston, Davy, Herschel, and Brewster, and it is to the encouragement of such practical education that we may look to maintain the high position and commercial prosperity we have held for so many generations.

“ The seeds of great discoveries are everywhere present  
 “ and floating around us, but they fall in vain on the unpre-  
 “ pared mind, and germinate only where previous inquiry has  
 “ elaborated the soil for their reception, and awakened the  
 “ attention to a perception of their value.” In the conclusion of his pamphlet, Dr. Booth observes,—

“ We have now cast aside the heavy armour of protection,  
 “ to wage that great commercial conflict in which we are  
 “ engaged, with limbs unfettered and with motions free. We  
 “ shall require all those aids which the discoveries of modern  
 “ science have placed within our reach,—all that force of  
 “ cultivated intellect which education in its most perfect form

“ can bestow,—all that perseverance and indomitable energy  
 “ which moral training, founded upon religion, can alone  
 “ create,—to bear us victorious through that mighty struggle  
 “ (and not the less mighty because peaceful) in which is  
 “ involved the destiny of our empire. For we know of no  
 “ instance where commerce has again revisited the abodes she  
 “ has once forsaken. The sun will not shine in the evening  
 “ where it shone in the morning; nor will ‘the shadow which  
 “ has gone down on the dial go backwards,’ as a sign of  
 “ returning health and vigour, to a people hastening to decay;  
 “ or to prolong the day of prosperity for a nation whose glories  
 “ are departing.”

That the sun may for ever shine on our native land, that its glories may not pass away, is the fervent prayer of one who, although almost a stranger to it, and whose destinies will most probably lead him far from hence for ever, still hopes, at least, to hear, that the intellectual and scientific improvement in the education so long desired has been brought about by means of the Exhibition, and through the power, talent, and energies of those who, through God’s blessing, have brought this great work to so happy a termination.

J. A. LLOYD,

*Special Commissioner for the Exhibition of 1851.*

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( *Copy.* )

No. 1.

*To the Right Honourable* EARL GRANVILLE.

MY LORD,

*Hyde Park, July 20th, 1851.*

In a very short lapse of time the vast and wondrous collection of the natural products of the earth, as well as the specimens of human skill and ingenuity, which are now beneath the roof of the Crystal Palace, will be dispersed and returned to their several owners.

With that distribution will pass away for ever the most favourable opportunity that England ever possessed of forming, at slight expense and very little labour, a vast and most useful collection of the products and works illustrating the arts and manufactures of the world, which might form the nucleus of a still more extensive museum of practical knowledge and manufactures, the want of which has been long felt in this country.

Before it may be too late I would take the liberty to urge that this favourable opportunity may be taken advantage of.

I would, therefore, suggest to the Royal Commissioners that under their sanction, a circular be addressed to all such Exhibitors who may have contributed to the Exhibition raw materials, products, processes of manufactures, models, &c., proposing to them that such contributions, where practicable, may be made a donation to some public institution for the diffusion of general practical knowledge, and that such circular be followed up by proper personal application to all parties where convenient.

I would also propose that the objects so presented should be placed under the charge of the Society of Arts and Sciences

of London; for which purpose a proper building should be obtained by means voted from the funds of the Royal Commission, who would impose certain conditions, if necessary, for the due fulfilment of the charge which, under such circumstances, would be intrusted to them.

Such a museum would approach in its object the establishment in Paris, termed the "Conservatoire des Arts et Métiers."

The archives of the Society of Arts will show how greatly the country has been indebted, for more than half a century, to that institution for encouraging and bringing to practical application, inventions and improvements in so many branches of the arts and manufactures, and which has tended so greatly to elevate the character for industry and mechanical skill which Great Britain maintains. That society has been prominent in extending protection and assistance to the honest and industrious artizan, that society has matured a project which its members, guided by the influence of its patron and the counsels of the Royal Commissioners, have carried out successfully; it is that society, therefore, to whom probably may be confided most advantageously, the task of perpetuating to the nation the advantages which have already resulted from the Exhibition of 1851.

I have the honor to be, my Lord,

Your obedient Servant,

J. A. LLOYD,

*Special Commissioner.*

No. 2.

*Hyde Park, August 12th, 1851.*

MY LORD,

Some days since I had the honour to forward to you a letter in which I suggested, that before the vast collection of raw materials, processes of manufactures, and works of industry, now under the roof of the Exhibition building, were



dispersed for ever, means should be taken to obtain donations for the purpose of founding a Museum of Arts and Industry, for the public instruction of the people, and thus approaching in its objects the "Conservatoire des Arts et Métiers" of Paris.

Since that time your Lordship, with many other gentlemen\* of the highest science and practical knowledge, have been conducted through that vast establishment by its talented director, Colonel Morin.

The lessons we have all learned in passing through the extensive galleries of that college must have impressed on the mind of every visitor, the great superiority in education which France thus possesses for the industrial classes, and in connexion with the still more extensive branches of instruction in the "Ecole des Arts et Métiers," it will go far to discover to us, why, a nation so close to our own shores, still maintains, in several classes of manufactures and design, a superiority over the artists and workmen in our own country.

Every native of France has easily within his reach a system of excellent theoretical education in all branches of Arts, Sciences, and Manufactures, which is carried on simultaneously with practical illustrations, derived from materials, models, machines and tools of every description, and which the museums of their Colleges possess for demonstration.

The education is so cheap, the acquirement of high scientific knowledge in connexion with interesting demonstration and manipulations of all descriptions, becomes to the youth of France so fascinating, that at an early age they often pass an examination showing such high qualifications in both science and the arts, that the services of these young men are sought for by almost all the great manufacturing countries in Europe.

England, by means of the Exhibition, and with the will of the Royal Commissioners, supported by Her Majesty's Government, possesses the golden opportunity of establishing a great

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\* Sir J. Burgoyne, Professor Willis, Professor Moseley, Dr. Playfair, and many others.



college for the instruction of the people in conjunction with a museum at its disposal, such as no other country ever inherited.

In France the "Conservatoire des Arts et Métiers" has been created only after a vast amount of pains, expense, and labour, extending over nearly two centuries; but it has now arrived at such a state of perfection that even the latest inventions of Sharp, Whitworth, Maudslay, Nasmyth, and others, are already represented by beautiful working models, which are transported to the vast amphitheatre to illustrate the graphic lectures of the different professors attached to the establishment.

England, on the other hand, just now possesses the power, not only of collecting but *selecting* from the Exhibition of 1851, the most perfect specimens of the produce of the creation, and of the arts, manufactures, and industry of the whole world, which shall become subservient to public instruction.

Many natives of our country and many foreigners, have already expressed their good will to contribute some of their works to a museum, and have even proposed to forward, from time to time, any inventions or improvements which they may have completed.

The great opportunity however is but ephemeral, and will soon pass away, perhaps for ever; I would therefore solicit the indulgence of His Royal Highness and the Royal Commissioners in entertaining the following proposals, and, since my visit to the "Conservatoire," additional suggestions.

- 1: That, as I have already urged, a circular be addressed to all such exhibitors who may have contributed to the Exhibition, raw materials, produce, processes of manufactures, models, &c., proposing that such contributions may be made a donation to the country for the purpose of establishing a public institution for the education of the people.

2. That the whole of the balance of the available funds derived from the Exhibition of 1851, be devoted to the endowment of a College of Arts, Sciences, and Manufactures



for the instruction of the people in the various branches, and that the museum shall be an auxiliary to this endowed College, and the various objects it contains shall be used for practically demonstrating the various groups of Arts and Trades.

3. That the works of nature and art collected from the Exhibition shall for the moment be deposited in some place of security.

4. That Her Majesty be solicited, graciously to aid in this great national project, by granting some public building for the establishment of the College and Museum.

5. That such establishments as the Museum of practical Geology, the schools of designs, or other insulated departments, be blended, and incorporated if possible into the College of Arts and Manufactures, and its professors there employed.

6. That works illustrating the sciences, arts, and manufactures may be collected from time to time, and that in regard to any proposed new patent laws, the inventor taking out any patent should be bound, either with or without remuneration, according to circumstances, to furnish to the Government, if required to do so, a working model or drawing, and description of the improvement or invention.

I have thus, Sir, endeavoured to place before you, but only crudely, and much abridged, a proposition which I humbly believe, if matured and carried out, would greatly benefit the nation, advance scientific knowledge, elevate the industrial classes by affording to them the means of obtaining a superior education, furnish to our designers, our great manufacturers, and our workshops, a high standard of intelligence and experience which we now too often look for in other quarters, and carry out the great principles of the Exhibition of Industry of all Nations which His Royal Highness has so anxiously and so successfully toiled for.

To illustrate the different phases through which the "Conservatoire des Arts et Métiers" has passed during either good or



bad management, I have taken the liberty to attach, in the Appendix, a short history of the establishment drawn from the archives of the department, and which I was permitted to peruse by the kindness of Colonel Morin.

I have also added a short description of the "Ecole des Arts et Métiers" of Paris, from a small work shown me by my friend Dr. Playfair, together with a list of the eminent men of the present age who have received their education at these establishments.

I have the honour to be, my Lord,

Your most obedient Servant,

J. A. LLOYD,

*Special Commissioner.*

### No. 3.

#### ORIGIN and HISTORY of the "CONSERVATOIRE DES ARTS ET METIERS of PARIS."

Descartes was the first who conceived the idea to establish public lectures for artificers and workmen. His plan was to have large lecture-rooms for each group of trades, where would be collected the various tools, models, &c., illustrative of manufactures belonging to every class.

To each great class was to be attached a practical lecturer or demonstrator, who, by perfectly understanding the manipulations of each trade, could not only reply to queries put to him, but actually show the artizans and students how to work. A century, however, passed without any results.

There already existed a collection of machines which would have much facilitated the project of Descartes, but they were under the charge of the Academy of Science, and had been placed in the Louvre, where at the revolution of 1780 they had been nearly a hundred years, without any great advantage derived from them.

In 1775, however, Vaucanson set to work on his own account; he collected a vast number of machines, models, and



scientific and philosophical instruments, and placed them in a building hired for the purpose, called the Hotel de Mortagne, rue de Charonne, Faubourg St. Antoine.

This great mechanic saw the advantage to the country of such a collection being placed before the people, in such a manner that they could not only obtain prompt and easy reference to works illustrating their several professions, but receive information from well-informed mechanics and scientific persons employed for that purpose.

On the death of Vaucauson in 1782, he left the whole of his collection to the Government, and this legacy, accepted by the nation, became the nucleus of the present "Conservatory" of arts and trades.

From that moment the Government, being determined to carry out on a more extended scale the project of Descartes and Vaucauson, appointed a comptroller-general, and by a new ordonnance required that all machines and models which by their merit deserved a reward from the nation should be deposited in this now increasing establishment.

A sum of 10,000 livres was accorded for its maintenance, and in 1784 l'Hotel de Mortagne was purchased for 120,000 livres.

From its foundation in 1783 to 1792, the total expense incurred was only 60,000 francs (2,500*l.*), yet during that time nearly 300 new machines and inventions had been added to the collection, consisting principally of improvements in cotton and carding machines, hosiery, and those for ribbons, laces, &c.

The fearful devastation of monuments, and the mutilation of works of art by the people, which the 10th August let loose on France, struck a heavy blow to the depôt of arts.

The Legislative Assembly, however, created a commission to secure what remained of works representing science and trades from the immense property which by late events had become national. During the disastrous year that followed their creation, they however did nothing.

By a decree of the 15th and 16th August, 1793, the



National Convention charged the Committee of Public Instruction to make inventories of all libraries, museums, and cabinets, and collections of works which belonged to the state ; and to ensure the preservation of these works, a certain number of men distinguished for their science and talent were associated with the Commission, and they were enjoined diligently to seek for, collect, and preserve for future use, all the precious works so unfortunately scattered and exposed to the cupidity of some, and the vandalism of others.

The Convention was so pleased with their labours, that by a decree of the 28th Frimaire, An. II. they instituted another Commission of Arts, the members of which were Vandermonde, J. B. Le Roy, Conté, Beuvelot, C. P. Molard, the Abbe Gregoire, and Charles, the celebrated physician.

It was to the zeal, and often courage of these men, that the country is indebted for the rescue of the various objects now partly forming the priceless collections in the museums of Paris. Some 800 works were saved by them, often at the peril of their lives, and lodged at a dépôt in l'Hotel D'Aguillen, rue de l'Université.

The value to the people, now generally admitted, of Vaucauson's exertions, prompted the Convention to adopt a decree drawn up by Gregoire, and published 19th Vendemaire, An. III.

This decree originated the present establishment, under the name of the " Conservatoire des Arts et Métiers," and ordered that a public dépôt should be established for all descriptions of machines, models, and tools, employed in all branches of manufactures, drawings and illustrations, descriptions and books of all kinds treating on arts, sciences, and manufactures.

To the establishment was attached three men of high talent and practical knowledge as lecturers, and a draughtsman, and the Committee of Arts and Manufactures was instructed, in concert with the Officers of Finance, to select the best site for the new Conservatoire.



"It is curious that the most violent opponents in the first instance to the establishment for the gratuitous instruction of the poorer classes, were the demagogues of the day ; for then, as now, there was no want of individuals in the Assembly, pretended friends of the people, who were always ready to excite their passions and abuse their interests. They were however beaten."

The Committee, after hesitating in the choice of a "locale," between the Palais National, then called the Palais Egalité, the Stables of the Louvre, the Church of St. Roche, the Hotel Montmorency, finally selected the Garde Meuble, which, after some delay, was destined to some other purpose, but in the mean time all the valuable works collected were rapidly increasing, not only from contributions from the Commission of Arts and Agriculture, but by the addition of valuable works from conquered countries.

The Directory determined however to carry out the Decree of the Convention, and on the 29 Fructidor, An. IV., presented to the Council of Five Hundred a proposition to destine the ancient and beautiful building of the Abbey Saint Martin des Champs, for the future Conservatory ; but it was refused from economy, and the Council charged the National Institute with the care of the collection. This resolution was carried to the Conseil des Anciens 27 Nivose, An. VI., and "Alquier" made an admirable report, deploring the false principles and petty economy which biassed the Council of Five Hundred to deprive the people of such invaluable instructions, saying in these memorable words,—“That those who were to come to the Conservatoire would be intelligent workmen and artificers, whose conceptions it was mischievous to obscure by mere abstract and scientific discourse ; they should be made to see, more than be inflicted on to hear what they did not understand. The working of a machine, a model put in motion before their eyes, was for them the best demonstration. Explanations to them should be brief, simple,



in their own style, and within the limits of their own education. It was necessary to place before them the science of facts, and not the science of talking."

Alquier resisted with all his might that part of the resolution of the Five Hundred recommending the Museum to the charge of the Institute of France, and urged by every means that the control of the establishment should be confided to practical men, and one phase in the history further on of the Conservatoire and its threatened destruction will show how sound his views were. His words were,—“That men of science, from the very fact that they indulged in the most profound and abstract studies, were absolutely strangers to that spirit of detail which was so precious an element for the preservation of objects of mechanical science.”

In speaking of the cidevant Académie de Sciences (which did not lack of men of the highest talent), he stated, that for nearly a century they had not only permitted the most valuable machines and inventions to accumulate without making them useful for public instruction, but these industrial discoveries and productions of the highest genius, and of the greatest artists, were consigned to oblivion in the vaults and galleries of the Academy, dispersed, dislocated, and neglected.

Alquier's energetic language, which was published, succeeded. The nation was so struck with his arguments, that the Council of Five Hundred named another Commission, consisting of Joseph Buonaparte, Fabre de l'Hérault, Lummais, Mortemir, Dussaie, and Gregoire. The Report made by Gregoire determined the Council, and the Abbey of St. Martin became (in 12 Germinal, An. VII.) the Conservatoire des Arts et Métiers of the present day. The members then appointed under the original decree were Le Roy, Conté, Molard, and Beuvelet, draughtsman. Conté, who was selected for the expedition to Egypt, was succeeded by Gregoire, and Montgolfier filled the chair of Le Roy, who



died. This administration only lasted to the An. IX., when Molard alone was named administrator. During Lucien Buonaparte's office as Minister of the Interior, all the machines scattered over the different dépôts were brought to the Abbey Saint Martin, and classified in such a manner as to realize the wishes of all, as far as artificers and workmen were concerned. But in 1806, M. de Champagny, the Minister for the Interior, determined to extend the advantages to the more youthful classes, and consequently founded a school for the education in Arts and Manufactures of the children of workmen, to be eligible under the recommendation of the Mayors and Prefects. This school became most flourishing, the courses of instruction comprised Arithmetic, Elementary Geography, the system of new Weights and Measures, Statics, Descriptive Geometry and its application to Stone-cutting, Carpentry, Cabinet-maker's work, Perspective, Mechanics, the transmission of Motion, Hydrodynamics, the description of Instruments and Machines of all kinds, Designing Ornaments, Figures, Machinery and Architecture, Designing for Embroidery, Silks and Stuffs, &c. From 1810 to 1811 *this school counted 300 students*; it furnished sub-officers to the Sappers and Engineers, young men in the offices of the Bureau of Fortifications, and of St. Cyr, as well as a great number of overseers of works, and superintendents of workshops and manufactories.

In 1810, Chaptal established a school for cotton and wool-spinning, after the encouragement which Napoleon had given, by offering a million of francs for competition in the manufacture of cotton and carding machinery.

A vast number of useful researches and experiments were made here under the countenance of the Emperor, and the progress of industrial improvements was most rapid, and rich collections were added from the treasures of the Duke d'Orleans in the galleries of the Palais Royal, the machines from the Institute, the Cabinet of Horology of Ferdinand



Berthoud, the Cabinet de Physique of Charles, and part of that of the Abbé Noaillet.

In the early part of 1812, Napoleon visited the Conservatoire, and some idea may be given of the importance it had attained, when the Emperor, on speaking to M. Gauthier, said, "You have here 250 young students; that is well, but the public instruction in your college is incomplete, it must be extended, and in two years you will have 500."

Unhappily, the very peculiarities of instruction which Alquier, and Descartes before him, had so insisted on, were abandoned for higher and more scientific oral lectures. The Conservatoire immediately felt the change, lingered, and declined.

In 1817, a new organization was given to the Conservatoire. A Royal Ordonnance, in 1819, created four Professorships in Sciences,—Mechanics, Physics, Chemistry, and Public Economy applied to industry.

The preamble of the Ordonnance proclaimed that the "Conservatoire des Arts et Métiers," since its institution, had rendered important services, but to attain completely the object of its foundation, there is wanting in the College the higher application of scientific knowledge to commerce and industry." In 1836, two Professorships of Agriculture were added, and in 1839, five more Professors were appointed.

Then the great experiment on education was tried, a higher class of scientific instruction gave place to the original and simple practical one, which was so well interpreted by the words of the legislature of l'An. VI. :—

"Students will learn at the Conservatoire, under experienced masters, the mechanical part, the construction of machines, a knowledge of the most improved tools, their use and application, the combination of motion, and the employment and application of mechanical forces. The system of instruction, in the presence of models and machines, will be complete, experience and practical knowledge only in



“speaking to the eyes will best bring conviction, and give solid instruction.”

The original practical demonstration disappeared, to give place to the highly scientific Professors, and the instruction by sight was abandoned for scientific oral dissertations.

The collections became only curiosities, or antiquities visited by a few, but never explained; space being wanted, the greater portion were removed, huddled and piled together in the unfrequented galleries; the practical portion of the students deserted the place. The Conservatoire, as far as its practical use to the people went, was no more.

In 1842, the Minister of Commerce, or Board of Trade, seeing the deplorable state of things, named a Commission under the presidency of the talented Thenard. The Commissioners having brought to light the causes of this “decadence,” proposed the remedies.

The present noble establishment is the result, and possessed, in 1850, 4,500 articles, representing 7,000 machines, besides a vast number of machines themselves, apparatus for the laboratory, philosophical instruments, tools, &c.\*

In conclusion, the sum of 1,600,000 francs was voted in 1846, for ameliorations and additions to the already vast establishment; it is rapidly increasing, and as rapidly filling with works and models of the greatest value.

Finally, the Minister of Commerce desired that the large amphitheatre of the establishment should be also used for special public conferences, for general instruction; and that on any discovery or invention being made, either in France or foreign countries, of sufficient interest to the arts, industry or commerce, either the inventions or drawings, and exact descriptions, should be obtained, deposited in the amphitheatre, and public attention called to it.

All new processes are also to be shown publicly by practical and experienced workmen, under the several Professors,

\* Also a splendid library of 15,000 volumes.

so that the people may be instructed in processes most valuable to them.

I have attached an estimate in detail for the year 1850, for the services of the Conservatoire, amounting to only 150,000 francs (6,000*l.*). I have also added a description of the various classes and lectures given, with the names of the Professors.

The lectures given on different days are as follows, in the two theatres :—

|           |                |   |
|-----------|----------------|---|
| Sunday    | C. Dupin       | Geometry, applied to the Arts and Statics.                |
|           | Olivier        | Descriptive Geometry, applied and theoretical.            |
|           | Morin          | Practical Mechanics, Steam-Engine.                        |
|           | Peligot        | Chemistry applied to the Arts.                            |
| Monday    | Pouillet       | Physics, applied to the Arts and Machines.                |
|           | Olivier        | Descriptive Geometry.                                     |
|           | Payen          | Chemistry, applied to the Arts.                           |
| Tuesday   | Professor Moll | Agriculture.  |
|           | Blanqui        | Industrial Economy.                                       |
|           | Wolowski       | Industrial Legislation.                                   |
| Wednesday | Pouillet       | Physics.  |
| Thursday  | Ebelmen        | Ceramic Arts and Manufactures.                            |
|           | Morin          | Mechanics.  |
|           | Peligot        | Chemistry, Metallurgy, Dyeing Colours, &c.                |
| Friday    | Moll           | Agriculture, Drainage, Irrigation, and Manure.            |
|           | Blanqui        | Industrial Economy.                                       |
|           | Wolowski       | Industrial Legislation.                                   |
| Saturday  | Payen          | Chemistry, Textile Substances, and Economic Manufactures. |

Messrs. Martelet, Armengaud, De Wailly, and Le Compté lecture also during the week to elementary and advanced classes, in geometry, designing of machines, and agriculture and industrial design, the student having first acquired reading, writing, and arithmetic.

Attached is an estimate in detail of the sums required for 1850. . . . Total 6,250*l.*

J. A. LLOYD.



## Division du Budget du Conservatoire des Arts et Métiers.

| Chapitre 1 . . . . .  | Traitements et gages . . . . .     | {<br>Traitements des Professeurs et des Précepteurs<br>Id. id. des Fontionnaires it employés<br>Gages et salaires . . . . .<br>Modèles . . . . .<br>Grands dessins, tableaux . . . . .<br>Dessins en calques . . . . .<br>Entretien des collections . . . . .<br>Frais divers . . . . .<br>Livres . . . . .<br>Abonnement . . . . .<br>Reliure . . . . .<br>Frais divers . . . . .<br>Cours de Mécanique, par M. Morin . . . . .<br>" de Géométrie, par M. Dupin . . . . .<br>" de Physique, par M. Poullier . . . . .<br>" de Chimie, par M. Pelletier . . . . .<br>" de Chimie indlle. par M. Faque . . . . .<br>" de Géométrie descrip. par M. Olivier . . . . .<br>" d'Agriculture, par M. Boussingault . . . . .<br>" d'Economie indlle. par M. Blanquin . . . . .<br>" de Législation par M. Wolowski . . . . .<br>" des Arts Céramiques, par M. Ebelman . . . . .<br>Dépenses diverses . . . . .<br>Modèles et prix . . . . .<br>Frais divers . . . . .<br>Batiments . . . . .<br>Entretien du jardin . . . . .<br>Bois et combustibles . . . . .<br>Fumisterie . . . . .<br>Frais de Chauffage, éclairage . . . . .<br>Id. de M. l'Administrateur . . . . .<br>Lampes, &c. . . . .<br>Huile, &c. . . . .<br>Moblier . . . . .<br>Fourniture de Bureaux . . . . .<br>Ports de lettres et mêmes frais . . . . .<br>Blanchissage, frottagé, &c. . . . .<br>Frais de transports . . . . .<br>Dépenses diverses . . . . . | Propositions<br>du<br>Conseil. | Sommes<br>par<br>Chapitre. | Décisions<br>du<br>Ministre. |
|-----------------------|------------------------------------|--|--------------------------------|----------------------------|------------------------------|
|                       |                                    |  |                                |                            |                              |
| Chapitre 1 . . . . .  | Traitements et gages . . . . .     | {<br>64,900<br>12,300<br>14,600<br>8,060<br>1,000<br>2,500<br>5,000<br>740<br>2,000<br>500<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000   | F.<br>91,800                   | F.<br>91,800               | F.<br>91,800                 |
| Chapitre 2 . . . . .  | Collections . . . . .              | {<br>1,000<br>2,500<br>5,000<br>740<br>2,000<br>500<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>17,300                   | F.<br>17,300               | F.<br>17,300                 |
| Chapitre 3 . . . . .  | Bibliothèque . . . . .             | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>2,000                    | F.<br>2,000                | F.<br>2,000                  |
| Chapitre 4 . . . . .  | Haut enseignement . . . . .        | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>10,800                   | F.<br>10,800               | F.<br>10,800                 |
| Chapitre 5 . . . . .  | Ecole de dessin . . . . .          | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>800                      | F.<br>800                  | F.<br>800                    |
| Chapitre 6 . . . . .  | Batiments . . . . .                | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>5,400                    | F.<br>5,400                | F.<br>5,400                  |
| Chapitre 7 . . . . .  | Chauffage . . . . .                | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>6,800                    | F.<br>6,800                | F.<br>6,800                  |
| Chapitre 8 . . . . .  | Eclairage . . . . .                | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>2,000                    | F.<br>2,000                | F.<br>2,000                  |
| Chapitre 9 . . . . .  | Dépenses Administratives . . . . . | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>6,600                    | F.<br>6,600                | F.<br>6,600                  |
| Chapitre 10 . . . . . | Service intérieur . . . . .        | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>3,300                    | F.<br>3,300                | F.<br>3,300                  |
|                       |                                    | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>3,200                    | F.<br>3,200                | F.<br>3,200                  |
|                       |                                    | {<br>1,000<br>2,000<br>2,200<br>2,200<br>2,800<br>500<br>500<br>700<br>400<br>600<br>200<br>5,000<br>400<br>6,800<br>800<br>2,000<br>1,600<br>5,000<br>2,000<br>1,000<br>1,200<br>200<br>1,800<br>150,000  | F.<br>150,000                  | F.<br>150,000              | F.<br>150,000                |



ORIGIN and DESCRIPTION of the CENTRAL SCHOOL of ARTS  
and MANUFACTURES at PARIS.

THE improvements in almost every branch of mechanics and manufactures, which had so rapidly succeeded one another in England and other countries during the first portion of the present century, made it requisite for France to adopt some more extensive system of education for the middle classes, and one in which practical and illustrative instruction should be more intimately blended with theory than that which already existed in the country.

Manufacturers had previously confided the direction of their establishments to zealous and intelligent workmen, raised from the humbler ranks; but, with a new era, they became convinced of the necessity of seeking a higher standard of intelligence and science than the workshops alone could furnish. Instruction in the applied sciences—in chemistry applied to the arts, and in industrial mechanics—had become necessary; and it was resolved, therefore, to afford to the youth of France, who were to obtain their future living by industry, such improved system of education as the circumstances of the case required. The creation of the "Ecole Centrale des Arts et Manufactures" was the result.

The Government establishment, called the "Conservatoire des Arts et Métiers," had already given industrial education to the poorer classes and mechanics gratis. The "Ecole Centrale" was designed to confer the same benefit on a superior portion of the industrial population.

The managers of the new institution started with the sound principle, that however numerous might be the different theoretical courses of instruction which each student might require, in order to qualify him for a special profession or trade, still such theory should be in intimate connexion with, and be made subservient to, industrial science. Thus the chemist who quitted the college should not only be well versed in theory and a good operator in the laboratory, but he should



also be a mechanic, a geologist, and a draughtsman—so that, in case of an emergency, he would not only know how to select the best materials, but to superintend the construction of works which he might eventually have to direct. It was assumed that by adopting this plan of a comprehensive scientific and practical training, young men would acquire an aptness, a general intelligence, and a taste for seeking knowledge after quitting the college, which would fit them for various useful careers.

None of the existing establishments afforded such advantages—neither the public colleges, the free schools, the *Ecole Polytechnique*, the “*Conservatoire des Arts et Métiers*,” nor any of the public schools for special objects. At the colleges, students were free to follow, with more or less assiduity, any particular course of lectures, or merely that portion most attractive to them. They abandoned their studies without responsibility, and their application was not enforced by any check. In the military schools the education was more perfect, but it was of a character purely adapted for military men; and they were, moreover, accustomed to an amount of political licence which was not desirable for the industrial class; while the *Conservatoire* was only destined for the improvement of mechanics and workmen who had already commenced their career in some particular trade.

The Central School of Arts and Manufactures was established to provide a remedy for these defects. Although a private establishment, it was placed first under the surveillance of the Minister of Public Instruction, and eventually, in 1838, under the Minister of Commerce and Agriculture, who, in his budget for that year, asked for certain sums to defray the expenses of sending up students to it. A commission of the Chamber of Deputies recommended the grant for the following reasons:—

“That this college was created in 1829, under the most eminent and experienced professors, for the purpose of forming engineers, directors of manufactories, and works of all descriptions.



This private establishment, which by its excellence and utility competes with our best public establishments, has created and put into practice a complete system of industrial education.

"It is at the same time a sequel to our Polytechnic School, and an adjunct to our schools for special arts or trades. This college meets the conditions which the age requires, and it has completely succeeded. This has been proved, both by the support given to it by our great manufacturers, and by the fact that all the young men educated there immediately find the most lucrative employment."

The money was granted by the Minister in 1838, and in 1842 it appears that nineteen of the "Conseils Generaux," in different departments in France, voted funds to send up to this college a certain number of young men from their towns; and the Minister had, it seems, made provision for forty, whose previous instruction and good conduct, and the positions of their families, had entitled them to the favour of the State.

The students of the establishment are of three classes—viz., those who are brought up by the State; those for whom funds have been voted by the Councils General of departments; and those received at the expense of their families.

In order to obtain admission, Government and departmental candidates are examined at Paris, before a jury named by the Minister of Commerce for this purpose each year. The candidates must have been registered and recommended by the department whence they come, and they must prove that they are between the ages of 18 and 21. They undergo two examinations—one oral, the other written; and they must solve with ease certain problems in elementary mathematics and geometry. They must write and describe their problems and theories well—draw by rule and compass, sketch and colour.

Without these qualifications it is impossible to be admitted as a Government student, and the juries are instructed to select those who show most literary attainments, and who "appear to have that description of intelligence which promises an aptitude for industrial science, rather than mathematical acquirements."

A great preference is given to those who have obtained the



necessary qualification in a high degree, and whose means are limited, and the administration is not to aid those whose families are in a position to defray the expenses of their education. All students may participate in an "Encouragement Fund" for the first year—but afterwards only to such as show the greatest amount of merit; and an augmentation may be accorded to a few who are remarkable for still higher qualities.

Private students are admitted at any age above 16. They, too, submit to both oral and written examinations. They must execute certain problems, and write clearly and correctly the theories as set forth in the programme. Foreigners as well as French students are admitted, provided they can write and read the language. In Paris, these examinations are made by a Board named yearly by the Council of Studies—in the departments by public professors of mathematics—and in foreign countries by the university professors; and all applicants must produce proper testimonials as to their morality.

The authority of the school is vested in a Director and a Council of Studies, consisting of nine professors. The Director lives in the college, and is charged with its administration and correspondence, but he cannot appoint professors; those are selected for their practical as well as theoretical experience. The Council admit or reject candidates after reading the statement of their examinations, and they report on the progress of each student—as to his aptitude and capabilities, and whether he is eligible to be transferred to a superior division, or whether his friends shall be requested to remove him. The students bind themselves by a solemn declaration to take no part in any conspiracy to oppose the execution of the decisions of their superiors, and they promise to enter into no coalition for imposing on the junior or senior branches of the college. No students are lodged within the college, and they are not permitted to wear *any description of uniform.*



The course of instruction is limited to three years, during which period it is obligatory. It includes lectures, daily examinations, drawing and graphic exercises, chemical manipulations, working in stone and wood, physics and mechanics, details in the construction of buildings and other works, and general annual examinations. The students are, in addition, expected to make notes and reports, and to visit the workshops and manufactories.

They are boarded and lodged at respectable houses in the immediate vicinity, at their own expense. Each year there are general examinations in every branch of science and art. In the middle of the second year the studies are sub-divided—one course is general, the other has special relation to the ultimate destination of the scholars.

The specialities are four in number:—

1. Mechanicians.
2. Constructors, as architects and engineers.
3. Mining and Metallurgy.
4. Chemistry, applied in all its branches, including agriculture.

After that period, the whole energies of the student are devoted to those branches of science on which the profession he is about to adopt depends.

With respect to diplomas and certificates, the students of the third year are admitted to competition for diplomas—a programme of examination being made out for each speciality. The competitors are allowed thirty-five days within the college to make out their designs and compose their memoir, and then they are examined by five professors in public and before the students of two years.

After the examinations, the professors in council grant diplomas to those who have excelled and who have passed with the greatest honours, and “certificates of capacity” to those who have given less general proof of the highest talent. At each examination those who do not advance sufficiently, or



are idle, are invited to retire. All the examinations are kept for reference in the archives of the college.

The fees for each student, including several extras, are altogether 870 francs (£36) per annum. That the institution is flourishing, is proved by the profits resulting from it; and that the country benefits by it, the long array of eminent persons who are named, together with a statement of their present employments, would most satisfactorily illustrate.

A perusal of the following abridged programme of the course of instruction at this institution will show the advantages which the industrial higher classes, as well as the mechanics, enjoy across the Channel, in all that relates to a superior class of practical education :—

PROGRAMME of the COURSE of INSTRUCTION at the CENTRAL COLLEGE of  
ARTS and MANUFACTURES, PARIS, abridged.

FIRST YEAR.

*Descriptive Geometry.*—Theory and application; perspective, drawing, and shading; stone cutting—details; carpentry—details.

*Analytical Geometry, and Mechanics generally.*—Theory of motion and equilibrium of forces; velocity, acceleration, force, mass; general principles of motion, gravity, power, effect; statics of solid bodies.

*Construction of Machines.*—Their description and use.

*Transformation and Modification of Motion.*

*Physics generally.*—Laws of gravity, balances, pendulum, and its application; hydrostatics, hydrodynamics, heat, magnetism, electricity, electro-dynamics and electro-magnetism, molecular action, acoustics, light, optics.

For the first year the students are made to manipulate, in determining the density of solids, liquids, and gases, the construction and use of barometers, thermometers, and hygrometers: determination of refractive powers, photometers, powers of rotation in liquids, saccharometers.

*Chemistry generally.*—*Minerals*, and the study of all objects not metallic; the atmosphere, gases. *Metallic*; general methods for extraction of metallic oxides; general properties of sulphurets, chlorides, &c.; general properties of the salts; metals useful either alone or in their combination for the arts.

*Organic Chemistry.*—Methods of analysis; principal organic products; their uses in the arts; acids, and their applications.

One day in the week in the laboratory, to practise the experiments they have seen in the lecture-room.

*Medicine and Natural History applied to Industry.*

*Hygeian Science and Physiology, as far as Public Health is concerned :—*

*First Part.*—Food, clothing; influence of heat and cold; dampness, and



a dry atmosphere ; sun and winds ; the health in different professions ; sanitary regulations and legislation.

*Second Part.—Natural History.*—The animal creation in all that relates to industry, the arts, and agriculture ; power, produce, and nutriment. The vegetable creation ; substances employed in the arts ; wood, textiles, cereals, wines, tanning, dyes.

*Drawing and Design in its various Branches.*—During the vacation, plans and elevations of buildings and works are executed, which must be presented at the commencement of the term.

#### SECOND YEAR.

The same as the first year, besides modelling in plaster for stone cutting, &c.

*Industrial Physics.*—Properties and construction of furnaces of all kinds for different descriptions of fuel, transmission of heat, sublimation, distillation, evaporation, heating air and liquids, refrigeration, lighting, ventilation, and sanitary arrangements of towns ; constructions of all kinds in model bricks and plaster of Paris.

During the recess the students visit works and manufactories, and are obliged to present detailed reports on them.

The students of the third year complete five different projects, on which there are conferences, one on each speciality every month.

*Second and Third Year.*—Applied mechanics in great detail, applied hydrodynamics, construction and setting up of machines, analytical chemistry in different branches for different professions, industrial chemistry both mineral and organic, agricultural chemistry.

*Public Works.*—Roads, bridges in stone, wood, iron, and suspension ; natural inland navigation, artificial inland navigation.

#### *Architecture.*

#### *Geology and Mineralogy.*

*Mining, Working and Ventilation.*—Metallurgy and fabrication in iron, steel, zinc, and copper, furnaces and foundries for all metals.

*Technology.*—Manufacture of cordage ; stone and wood sawing, textile manufactures in cotton, wool, flax, silk ; cotton spinning, expression of oils, grinding, felting, ceramic works and pottery.

*Special Courses for the Third Year.*—Steam engines of all descriptions ; railways and different systems for locomotion ; the students visiting the most important works with their professors.



## No. 5.

List of PROFESSORS who conduct the different branches of SCIENCE at the COLLEGE. :—\*

|                           |  |
|---------------------------|--|
| Professor Olivier . . . . | Geometry.                              |
| M. Martelet . . . .       | Analytical Geometry and Mechanics.     |
| alter de St. Ange. . . .  | } Construction of Machines.            |
| M. Faure . . . .          |  |
| Professor Masson . . . .  | Physics generally.                     |
| Professor Dumas . . . .   | } Chemistry generally.                 |
| Professor Cahours . . . . |  |
| Professor Rigout . . . .  | Chemical manipulation.                 |
| Professor Doyere . . . .  | Medicine, and applied Natural History. |
| Professor Pécelet . . . . | Industrial Physics.                    |
| Professor Belanger. . . . | Applied Mechanics.                     |
| Professor Peligot . . . . | Chemical Analysis (2nd year).          |
| Professor Payen . . . .   | Industrial Chemistry.                  |
| Professor Mary . . . .    | Architecture and Public Works.         |
| Amédée Burat . . . .      | Mining.                                |
| M. Ferry . . . .          | Metallurgy of Iron.                    |
| M. Thomas. . . .          | Steam Engines.                         |
| M. Perdonnet . . . .      | Railways.                              |

The following is an approximate analysis of the present occupations of men of eminence who were students in the College.

## AGRICULTURE AND METALLURGY.

|                |    |                       |
|----------------|----|-----------------------|
| French . . . . | 10 | 7 employed in France. |
| Poles . . . .  | 2  | 1 „ Turkey.           |
|                |    | 1 „ Algeria.          |
|                |    | 1 „ Poland.           |
|                |    | 1 „ Galicia.          |
|                |    | 1 „ Louisiana.        |

## ARCHITECTURE, BUILDING, CANALS.

|                |    |   |
|----------------|----|---|
| French . . . . | 32 | 30 employed in France and holding some of the highest scientific appointments in the State. |
| Poles . . . .  | 2  | 1 employed in Wallachia.  |
|                |    | 1 „ Algiers.  |
|                |    | 1 „ Germany.  |
|                |    | 1 „ Switzerland.  |

\* The ancient students from this college have formed themselves into a Society, called the "Société Centrale des Ingénieurs;" they are bound to protect and assist those who leave the college with diplomas.

## RAILWAYS.

|                   |    |                                   |
|-------------------|----|-----------------------------------|
| French . . . . .  | 84 | 85 in France, holding the highest |
| German . . . . .  | 2  | appointment on the railways,      |
| English . . . . . | 1  | telegraphs, &c., throughout the   |
| Poles . . . . .   | 4  | State.                            |
|                   |    | 1 employed in Wurtemberg.         |
|                   | 1  | " England.                        |
|                   | 1  | " Belgium.                        |
|                   | 1  | " Germany.                        |
|                   | 1  | " Switzerland.                    |
|                   | 1  | " The United States.              |

## INDUSTRIAL AND SCIENTIFIC INSTRUCTORS.

|                       |    |                        |
|-----------------------|----|------------------------|
| French . . . . .      | 29 | 29 employed in France. |
| Spaniards . . . . .   | 2  | " Spain.               |
| Chilian . . . . .     | 1  | " Chili and Rio.       |
| Swiss . . . . .       | 1  | " Switzerland.         |
| Rio Janeiro . . . . . | 1  | " Greece.              |
| Greek . . . . .       | 1  | " Cracow.              |
| Pole . . . . .        | 1  |                        |

## SPINNING, TEXTILE FABRICS, COLOUR-PRINTING, DYEING.

|                     |    |                                |
|---------------------|----|--------------------------------|
| French . . . . .    | 16 | 10 employed in or near France. |
| Swiss . . . . .     | 3  | 4 " Switzerland.               |
| German . . . . .    | 1  | 6 " Germany.                   |
| Spaniards . . . . . | 2  | 2 " Spain.                     |
| Swede . . . . .     | 1  | 1 " Sweden.                    |

## PUBLIC FUNCTIONARIES (AS DIRECTORS, CONSERVATEURS GRAND VOYERS, &amp;c.)

|  |    |                        |
|--|----|------------------------|
| French (doubtful) . . . . .                          | 17 | 18 employed in France. |
| Spaniards . . . . .                                  | 2  | " Spain.               |
| Foreigners from various parts of the world . . . . . | 3  | " Brazils.             |
|  | 1  | " Switzerland.         |
|  | 1  | " Bolivia.             |
|  | 1  | " Moscow.              |
|  | 1  | " Greece.              |
|  | 1  | " Wallachia.           |
|  | 1  | " Corsica.             |
|  | 1  | " Dresden.             |
|  | 2  | " New Grenada.         |
|  | 1  | " Chili.               |
|  | 1  | " Venezuela.           |
|  | 1  | " Italy.               |
|  | 4  | various.               |



INDUSTRIAL CHEMISTRY, CERAMICS, GLASS MANUFACTURE, TANNERIES,  
SUGAR AND GAS-WORKS.

|                    |    |    |                                |
|--------------------|----|----|--------------------------------|
| French . . . .     | 37 | 31 | employed in France, Haut-Rhin. |
| Swiss . . . .      | 1  | 2  | " Russia.                      |
| Russian . . . .    | 1  | 1  | " Amsterdam.                   |
| Other Foreigners . | 4  | 1  | " Brazils.                     |
|                    |    | 1  | " Isle of Bourbon.             |
|                    |    | 1  | " America.                     |
|                    |    | 3  | " Germany.                     |
|                    |    | 1  | " Switzerland.                 |
|                    |    | 1  | " Prussia.                     |
|                    |    | 1  | " Prague.                      |

CIVIL ENGINEERS.

|                  |    |    |                         |
|------------------|----|----|-------------------------|
| French . . . .   | 34 | 31 | employed in France.     |
| American . . . . | 2  | 1  | " Rio.                  |
| Egyptian . . . . | 1  | 1  | " United States.        |
| Cuban . . . .    | 1  | 1  | " Egypt.                |
| Belgians . . . . | 2  | 4  | " Germany or Haut-Rhin. |
| Doubtful . . . . | 4  | 3  | " Belgium.              |
|                  |    | 1  | " Spain.                |
|                  |    | 2  | " Holland.              |

MECHANICS' MACHINERY.

|                     |    |    |                     |
|---------------------|----|----|---------------------|
| French . . . .      | 21 | 17 | employed in France. |
| United States . . . | 2  | 2  | " Haut-Rhin.        |
| Russian Poles . . . | 2  | 1  | " Belgium.          |
|                     |    | 1  | " Prussia.          |
|                     |    | 2  | " Creusot.          |
|                     |    | 2  | " England.          |

METALLURGY, MINING, SMELTING FORGES.

|                      |    |    |                          |
|----------------------|----|----|--------------------------|
| French & Foreigners, |    | 40 | employed in France.      |
| difficult to distin- |    | 9  | " Germany or close to it |
| guish. . . .         | 69 | 3  | " Algeria.               |
|                      |    | 1  | " Turin.                 |
|                      |    | 2  | " Spain.                 |
|                      |    | 1  | " Ireland.               |
|                      |    | 1  | " Tunis.                 |
|                      |    | 4  | " Belgium.               |
|                      |    | 2  | " Tuscany.               |
|                      |    | 1  | " Crimea.                |
|                      |    | 4  | " Prussia.               |
|                      |    | 1  | " Russia.                |

PAPER-MAKING, ENGRAVERS' PLATES, PLATING, COMMERCE.

20,—all employed in France.

In addition to the two establishments already described, there are three very large provincial colleges of arts and trades in France, founded especially for the instruction of the industrial classes. The first and most ancient was founded by the Duc de Rochefoucault, at Chalons-sur-Mer, another is at Angers, and the third at Aix.

They are entirely Government establishments. The expenses voted for each are 300,000 francs, or 12,500*l.* per annum, for the education and maintenance of 250 scholars in three divisions.

The term of study is three years, during which they are taught mathematics, descriptive geometry, practical mechanics, and elementary drawing of machinery, the elements of physics and chemistry, sufficient for their future career.

The scholars are lodged and maintained in the college.

In the day, five hours are devoted to study, and seven hours to the various workshops—of smiths, foundries, turnery shops, carpenters and wheelwrights, &c.; and such appears to be the taste of the students, that most of them await with the greatest impatience the hour when their practical labours commence.

At the end of the three years they undergo very strict examinations, and receive their certificates of competence.

From these sources almost all the Government establishments, and a vast number of others, are supplied with men of energy, intelligence, and practical knowledge, as foremen, draughtsmen, and clerks of works.

At one time, as was the case with the Conservatoire, a higher class of practical education was attempted. The results were, that the most intelligent and advanced of the young men "got above their business"—became more scientific than practical; and the others of less intellect, not being able to overcome the difficulties of instruction which was beyond their perception, lost their time. In most cases, industrial mechanics was abandoned for other employment.



The evil was quickly perceived and remedied, and the schools of trade now work well.

The Professors are now selected only from persons who undergo a very severe examination before a jury of practical men. He must be between twenty-five and forty years of age—he must have directed, as engineer or assistant-engineer, some establishment under the State, or some private industry of consequence: he must, in addition, submit some detailed project of his own, and be possessed of the acquirements set forth in a programme.

The foremen and sub-foremen of the works must be between the ages of twenty-five and thirty five, and have passed at least three years in some great establishment of public instruction.

J. A. LLOYD.

The following copies of some of the many memorials to the Royal Commission, which have been presented, are inserted to show the nature of the feeling which exist in the manufacturing districts.

“TO HIS ROYAL HIGHNESS PRINCE ALBERT and others, the ROYAL COMMISSIONERS for the EXHIBITION of the INDUSTRY of ALL NATIONS for 1851.

“We, the undersigned magistrates, merchants, manufacturers, designers, and others, interested in the commercial and manufacturing prosperity of the town of Birmingham, beg respectfully to address your Honourable Board.

“Your memorialists have witnessed with the highest gratification and pride, the unparalleled success of the Exhibition of 1851, and the beneficial results which it has drawn forth, and which will be felt not only by this nation, but by the whole civilized world.

“This vast undertaking, conceived in the first instance by your Royal Highness, interpreted in its true light by the various great manufacturing districts of this kingdom, and carried out so effectively by all nations, has produced a large surplus from its revenues, which, if devoted to some great object, might extend the beneficial effects of the Exhibition of 1851 over centuries to come.

“With this object your memorialists, as partly representing one of the greatest manufacturing towns of the empire, have felt called on to address your Board.

“Amongst the many projects for usefully disposing of the large sum of



money alluded to, one, apparently the most favoured, has been to purchase the great building for the purpose of creating a winter garden.

"Your memorialists feel that, whatever might be their individual opinions on the advantages of such a project to the inhabitants of and visitors to the metropolis, still they cannot perceive that the solemn pledge given to the original subscribers and to the country, to devote any surplus to the promotion and improvement of arts and manufactures, could be fully carried out by such an appropriation, or that such would benefit the nation generally.

"Your memorialists have long felt the necessity of some more extended system of practical and scientific education in England, which should place within the reach of the industrial classes a much higher standard of scientific attainments than they can now ever hope to possess without very ample means.

"Your memorialists are convinced that, with greater facilities in elementary scientific education, intimately connected with, and always accompanied by, practical illustrations and manipulations, there would be found as much original genius and talent to develop in the people of this country, as in those of the great continental States of Europe, and that such development would greatly facilitate the maintenance and extension of our manufactures and commerce.

"The great and rapid strides which locomotion has taken on the Continent, and the constant international communication which is the result, have extended science, and mechanical and artistical knowledge, widely over those nations; and thus one vast school of arts and sciences exists, with its members in constant communication, from which this country is partially excluded from its geographical position.

"Some of your memorialists, in their late visit to Paris, have witnessed the advantages which the rising generation of manufacturers is there enjoying, in their educational establishments; and although not favoured by the possession of such vast resources in raw materials, mineral wealth, and fuel, as Great Britain has the blessing to enjoy, they have established such colleges as the Conservatory of Arts and Manufactures, and the Central School of Arts and Manufactures, which are especially destined for the instruction of manufacturers and artisans, either entirely free or at a low charge.

"These central colleges, under the charge of the State, and with most efficient and interesting museums attached, have ramifications extending over other important manufacturing districts of the country.

"In such schools are the youth of France brought up, receiving, particularly in the provincial schools attached to the Conservatory, and in the Central School of Arts, the highest standard of scientific instruction in connection with the arts, manufactures, and design, matured by practical illustrations and experience in manipulation, and a knowledge of the particular trade to which they are eventually to devote their professional talent as designers.

"Numerous young men educated at these colleges, of first-rate talent and practical experience, pass examinations of very high standard, and receive diplomas, which are a passport for them to many parts of the Continent, as managers and directors of most important manufactories and establishments, and enabling them to find lucrative employment even in England.

"From these sources have sprung some of the most eminent men of the age, enjoying rank, consideration, and wealth, derived from the systematic education which they receive there.

"Your memorialists admit with pleasure and gratitude that the Government has already made a great step in advancing this object by the establishment of Schools of Design, and the Museum of Practical Geology; but still the first are only partial in their advantages, and the latter only an



isolated branch, which exerts but little immediate beneficial influence over the arts and manufactures generally.

"Your memorialists, therefore, deeply convinced that a more general and efficient system of scientific practical education is required, would respectfully suggest to your Honourable Board that the Exhibition of 1851 has developed more fully the necessity for such means of instruction, and has also provided ample means for accomplishing an object so closely allied to the original intention respecting the disposal of any surplus receipts from the Exhibition.

"For such reasons your memorialists would solicit that a great central college of arts and manufactures should be established in London, and endowed with the whole of such surplus receipts, which will probably exceed £200,000: and that a museum of arts and manufactures shall be formed at the college, the basis of which might be most advantageously selected from the present Exhibition.

"That provincial schools, having the same object in view (such as schools of design), should have connection with the great central college, and be carried on under the same system; and in order that the public may be satisfied with the administration of these provincial establishments, and have a voice in the general system of education, which is of such vital importance to their own commercial prosperity, your memorialists would suggest that where such provincial schools may be founded in boroughs, the mayors should be *ex-officio* members of the general board of metropolitan direction.

"Your memorialists have thus endeavoured to set forth to your Honourable Board the sentiments which have so strongly urged them to act. They are desirous to devote their best energies in furtherance of an object which they feel is for the honour and welfare of their country; and they have the fullest confidence that your Royal Highness and the Royal Commission, who have carried out so successfully the vast undertaking which devolved on them, are the persons pre-eminently qualified to undertake an object of such great national importance.

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"TO HIS ROYAL HIGHNESS PRINCE ALBERT, and the other Royal Commissioners for the GREAT EXHIBITION of 1851.

"The memorial of the undersigned magistrates, bankers, manufacturers, and others, inhabitants of the city of Bristol, subscribers towards the funds raised for promoting the Great Exhibition.

"Your memorialists most respectfully approach your Honourable Board with an expression of their warmest congratulations at the unparalleled success which has crowned the exertions of your Royal Highness and your colleagues, in establishing and bringing to so gratifying an issue an undertaking which has justly received such universal admiration. These congratulations have reference not only to the past but to the anticipated benefits which your memorialists confidently expect will be the result of the Exhibition, not to our own nation alone, but to the whole civilized world.

"Your memorialists have heard with unfeigned pleasure that the funds of the Exhibition will be sufficient, after meeting every demand on them, to realize a very considerable surplus, and your memorialists having lent their assistance in causing this surplus, consider they will not be exceeding the bounds of respect due to your Royal Highness and the other Commissioners if they venture an opinion as to its application.

"The project of establishing a winter park and garden in London, on a self-supporting principle, has attracted a considerable portion of public attention, and deservedly so, as it would preserve to the country the wonderful



structure in which the Exhibition is held. Desirable, however, as such an object may be, and adding, as it undoubtedly would, to the attractions, and probably to the health, of the metropolis, your memorialists are yet of opinion that some object of more general utility might be attained by a better application of your funds, more conducive to national prosperity, and more in accordance with the expressed intentions of the Commissioners, to appropriate any surplus 'to purposes strictly in connection with the ends of the Exhibition.'

"At a moment like the present, your memorialists have no doubt that your Honourable Board are in constant receipt of projects for the application of this surplus, from parties of most varied opinions, and suggesting schemes of every possible shade of difference, and your memorialists are therefore reluctant to do more than express their approbation of a plan which they consider presents prospective advantages of greater magnitude to the whole community than any other that has been brought under their notice—namely, the establishment of a collegiate institution in London, resembling in some degree the Central School of Arts and Manufactures at Paris.

"It would be superfluous in your memorialists to point out the advantages resulting to our artisans from having within their power the means of obtaining at a moderate expense a sound, scientific, and practical education in those branches of trade or manufacture to which their lives are to be devoted. These advantages are too obvious and well known to your Honourable Board to require more than a simple allusion to them, and your memorialists think that no more legitimate mode of applying the surplus at your disposal can exist, than by appropriating it to the elevation of the character and intellect of the British workman, to whose skill and ingenuity (however untutored) the Great Exhibition owes so much, by encouraging discovery, stimulating industry, and offering him the same facilities for acquiring knowledge in his profession which are enjoyed by many of his foreign competitors.

"Your memorialists abstain from any details as to the benefits to be derived from the adoption of such an institution, and content themselves with merely suggesting that if any plan analogous to that above referred to should meet the approval and countenance of your Honourable Board, you will devise such means as will render it as diffusive as possible, and take measures that it shall become an institution not confined to one locality, but by means of provincial schools, in connection with a Metropolitan Central College, pervading and receiving attention and encouragement in the great manufacturing and commercial cities of the empire, so that what is at this moment a just source of national pride, may in its ultimate results prove a national blessing."